

# Multifunctional Hot Structure Heat Shield

Completed Technology Project (2013 - 2016)



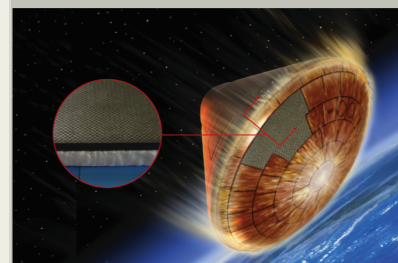
## Project Introduction

This project is performing preliminary development of a Multifunctional Hot Structure (HOST) heat shield for planetary entry. Results of this development will determine the feasibility of the HOST heat shield to provide benefits over the conventional approach. Preliminary results indicate that both mass and volume savings are achievable with the HOST concept compared to a traditional heat shield design.

The Multifunctional Hot Structure (HOST) heat shield concept is unique in integrating the function of the thermal protection system (TPS) with the primary load carrying structural component. An advanced carbon-carbon material system has been evaluated for the load carrying structure, which will be utilized on the outer mold line (OML) surface of the heat shield, and thus will operate as a hot structure exposed to the severe aerodynamic heating associated with planetary entry. Flexible, highly efficient blanket insulation has been sized for use underneath the hot structure to maintain desired internal temperatures. The approach is to develop a preliminary design to demonstrate feasibility of the concept. The preliminary results indicate that the concept has the potential to save both mass and volume with significantly less recession compared to traditional heat shield designs, and thus provide potential to enable new planetary missions. Initially, an earth return mission was evaluated using a spherical section type heat shield concept for a traditional earth entry capsule. Then a Mars entry sphere-cone concept was evaluated. Currently, a Mid-L/D concept for Mars entry is being studied. Results of this study should demonstrate the feasibility and advantages of the HOST concept, which may enable future planetary missions.

## Anticipated Benefits

HOST can be demonstrated on an ISS return mission while offering a more lightweight alternative to the traditional ablating TPS currently being employed.



Project Image Multifunctional Hot Structure Heat Shield

## Table of Contents

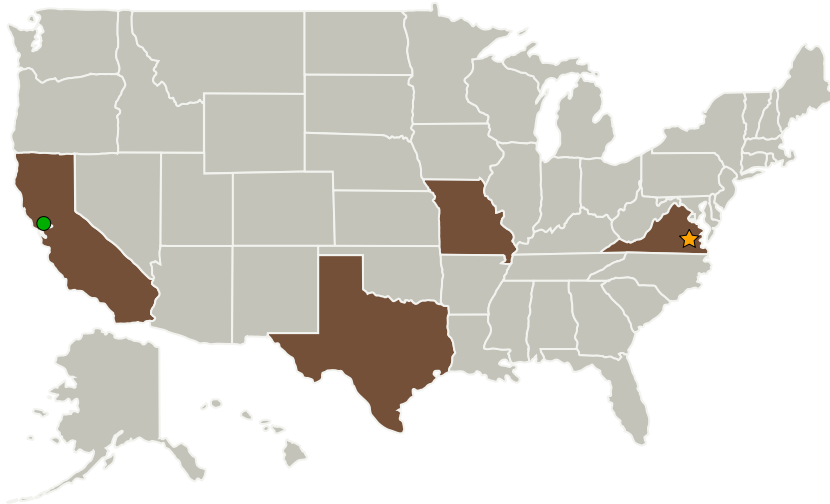
Project Introduction	1
Anticipated Benefits	1
Primary U.S. Work Locations and Key Partners	2
Organizational Responsibility	2
Project Management	2
Images	3
Stories	3
Technology Maturity (TRL)	3
Technology Areas	3

## Multifunctional Hot Structure Heat Shield

Completed Technology Project (2013 - 2016)



## Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★ Langley Research Center (LaRC)	Lead Organization	NASA Center	Hampton, Virginia
● Ames Research Center (ARC)	Supporting Organization	NASA Center	Moffett Field, California

Co-Funding Partners	Type	Location
Boeing Research & Technology	Industry	

Primary U.S. Work Locations	
California	Missouri
Texas	Virginia

## Organizational Responsibility

**Responsible Mission Directorate:**

Space Technology Mission Directorate (STMD)

**Lead Center / Facility:**

Langley Research Center (LaRC)

**Responsible Program:**

Center Innovation Fund: LaRC CIF

## Project Management

**Program Director:**

Michael R Lapointe

**Program Manager:**

Julie A Williams-byrd

**Project Manager:**

Sandra P Walker

**Principal Investigator:**

Sandra P Walker

**Co-Investigator:**

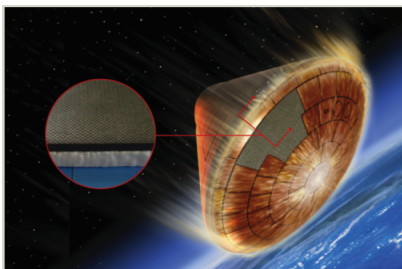
Kamran Daryabeigi

## Multifunctional Hot Structure Heat Shield

Completed Technology Project (2013 - 2016)



## Images

**12022-1378761519314.png**

Project Image Multifunctional Hot Structure Heat Shield  
(<https://techport.nasa.gov/image/2291>)

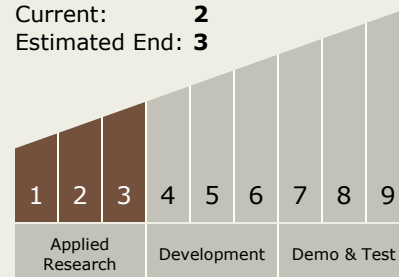
## Stories

A Multifunctional Hot Structure Heatshield Concept for Planetary Entry  
(<https://techport.nasa.gov/file/24284>)

Preliminary Development of a Multifunctional Hot Structure Heat Shield  
(<https://techport.nasa.gov/file/22007>)

## Technology Maturity (TRL)

Start: **1**  
Current: **2**  
Estimated End: **3**



## Technology Areas

## Primary:

- TX14 Thermal Management Systems
  - └ TX14.3 Thermal Protection Components and Systems
    - └ TX14.3.2 Thermal Protection Systems